A SYSTEMATIC REVIEW OF COMMUNITY PHARMACIST THERAPEUTIC KNOWLEDGE OF DIETARY SUPPLEMENTS

ABSTRACT

Background: Internationally, the use of dietary supplements has been growing rapidly. Patient support for pharmacist sales of nutritional and dietary supplements is also strong. The increase in demand for nutritional and dietary supplements and subsequent advice about these products, however, makes it necessary that pharmacists maintain a contemporary knowledge of the area.

Aim of Review: This systematic review was conducted to examine the current evidence regarding the level of the nutritional and dietary supplement knowledge of community pharmacists and their understanding of their therapeutic effects. Method: Electronic databases including Medline, Scopus, Embase, CINAHL, Scifinder and the Cochrane Controlled Trials Register were searched. Studies assessing nutritional knowledge of pharmacists in community pharmacies were eligible for inclusion. All languages and study designs were considered. Study results were analysed and pharmacist knowledge scores were given out of 100%.

Results: From 5594 studies identified, nine met the inclusion criteria. Each study tested pharmacist knowledge with predetermined questions calculating results as the number of questions answered correctly. These knowledge scores were converted to a percentage score for the purpose of this paper. The median knowledge score across all papers was 64%. A lack of studies assessing community pharmacists' knowledge of commonly sold vitamins and minerals was observed. Conclusions: Global community pharmacist knowledge of dietary supplements appears to be poor.

Community pharmacists have an professional responsibility to provide accurate health information about dietary supplements as they do for any other therapies they provide to patients. Further research including that which assesses pharmacists' therapeutic knowledge of commonly sold vitamins and minerals is suggested.

INTRODUCTION

Chronic diseases are related to significant healthcare costs and societal burden.[1] The World Health Organisation recognises diet as a major modifiable determinant of chronic disease.[2] Dietary supplements are defined as "a product (other than tobacco) that is intended to supplement the diet that bears or contains one or more of the following dietary ingredients: a vitamin, a mineral, an herb or other botanical, an amino acid, a dietary substance for use by man to supplement the diet by increasing the total daily intake, or a concentrate, metabolite, constituent, extract, or combinations of these ingredients".[3] These products can provide a benefit to patients with chronic diseases. For example, the use of calcium and vitamin D improves bone mineral density and prevents fracture in patients with osteoporosis, folic acid supplementation reduces side effects of rheumatoid arthritis patients on methotrexate, and, the use of fish oil or other omega-3 fatty acid supplements to reduce mortality in patients with cardiovascular disease.[2,4,5,6] As such, the use of these products is frequently recommended by many health professionals. However, dietary supplements can also have detrimental effects or provide no benefit and should not be routinely recommended. For example, vitamin E supplementation has been suggested to benefit cardiovascular health, however numerous studies have failed to demonstrate this and conflicting evidence has associated vitamin E supplementation with an increase in total mortality and stroke.[7,8] Another example, St John's Wort is

commonly used as a treatment for depression, however has been shown to interact with many antidepressant medications and thus cause harm to the patient.[9]

With extended opening hours and generally no appointment necessary for service, community pharmacists are known for being accessible health professionals. As such, the role of these pharmacists is expanding to include public health promotion and specifically, nutritional advice. Recent estimates suggest that approximately 94% of Australians visit community pharmacies annually.[10] This allows numerous opportunities for pharmacist-led nutritional interventions. Many pharmacists have embraced this opportunity and now look to expand their sales of vitamin and mineral supplements.[10]

In recent years, Australian use of complementary medicines including vitamins and minerals in a 12-month period has been estimated at 69% of the population. The annual expenditure of vitamins and minerals in estimated at AU$1.8 billion and greater than half of this expenditure is being made in pharmacies.[11,12] The National Institute of Complementary Medicines estimates that expenditure on complementary medicines in Australia is more than four times that spent on pharmaceuticals and growth for this industry is currently recorded at between 3-12% annually.[11]

Internationally, the use of dietary supplements has also been growing rapidly.[13,14] In the United States, sales of herbal medicines have more than doubled in the last 2 decades.[15] Annual revenues of sales of herbal supplements reached US$5 billion in Western Europe in 2003-2004 and US$14 billion in China in 2005.[16,17]

Patient support for pharmacist sales of nutritional and dietary supplements is strong.[17] Patients expect to be able to access an extensive range of vitamin and mineral products in community pharmacies.[15] A recent systematic analysis found that patients believe there is a role for the sale of dietary supplements in pharmacies and that pharmacies should be selling these products and that pharmacists have a professional responsibility to advise and educate patients on these products as they believe that the pharmacist has expertise in this area.[17]

The increase in demand for nutritional and dietary supplements and subsequent advice about these products, however, makes it necessary that pharmacists maintain a contemporary knowledge of the area.[17] A systematic review by Boon *et al* (2009) identified that pharmacists in North America appear to be ill equipped to advise patients about these products due to a lack of nutritional education.[17] A recent analysis of pharmacy courses in the UK supported this suggestion, asserting that the majority of courses do not include any compulsory nutrition specific units.[18] This trend is reflected in the Australian Universities and also across the United States.[19] These findings suggest that pharmacists may lack appropriate levels of education in this area. With little emphasis on nutritional education, pharmacists have an ethical responsibility to educate themselves on dietary supplements if they intend to practice in that scope.

There is little known about the knowledge of community pharmacists in the provision of advice to patients relating to products that are intended to complement the diet containing vitamins, minerals, herbs or other dietary substances. Consequently, the

aim of this systematic review was to examine the evidence regarding the level of the nutritional and dietary supplement knowledge of community pharmacists.

AIM OF REVIEW:

This systematic review was conducted to examine the current evidence regarding the level of the nutritional and dietary supplement knowledge of community pharmacists and their understanding of their therapeutic effects.

METHOD:

A systematic review was conducted using a pre-determined protocol based on the Cochrane Collaboration Systematic Review methods.[20]

The inclusion criteria in this systematic review were:

1) The study assessing pharmacists' therapeutic knowledge of dietary supplements was conducted in a community pharmacy setting.

2) The study assessing the dietary supplement therapeutic knowledge of community pharmacists included awareness of herbal, vitamin, mineral, macro- or micronutrient intake or supplementation.

3) The assessment of community pharmacists' therapeutic knowledge included the implementation of mystery shoppers and written or oral questionnaires.

The exclusion criteria in this systematic review were:

1) The study examined pharmacist therapeutic knowledge of diet tools such as meal replacements.

2) The study did not include a method of measuring pharmacist therapeutic knowledge. No restriction on language, study design or publication status was imposed.

Search Strategy

An electronic search strategy was constructed to incorporate community pharmacy, nutrition and pharmacist knowledge and assessment of interventions through implementation of the following search terms:

1. nutrit* .tw.
2. diet* .tw.
3. intake/ .tw.
4. or/1-3
5. (community pharma*) .tw.
6. pharma* .tw.
7. 5 or 6
8. 4 and 7
9. inform* .tw.
10. recommend* .tw.
11. knowledge/ .tw.
12. awareness/ .tw.
13. counsel* .tw.
14. or/10-13
15. 8 and 14
16. Remove duplicates from 15

Search terms encompassed Medical Subject Headings and text words. The terms encompassed community pharmacy, weight, nutrients and intervention types.

Six online databases were searched: Medline, Scopus, Embase, CINAHL, Scifinder and the Cochrane Controlled Trials Register. Literature published prior to January 1 1990 and published after 30 September 2013 were not included in this study. A

supplementary approach was used to identify any additional studies within grey literature. This involved a key word search on grey literature databases Trove and Proquest using terms such as ‘pharmacist’ and ‘community pharmacy’ coupled with words pertaining to nutrient supplements: ‘vitamin’, ‘mineral’, ‘supplement’, ‘diet’ and ‘nutrient’.

Study Selection

The primary outcome was assessment of community pharmacist knowledge. Following the initial systematic search, the primary author (FW) removed duplicates and screened the titles and then abstracts of all articles identified. Any papers deemed potentially relevant during each screening step progressed to the subsequent step. All papers that passed the abstract screening were retrieved and examined to determine relevance (n=106). Figure 1 offers a schematic representation of this process.

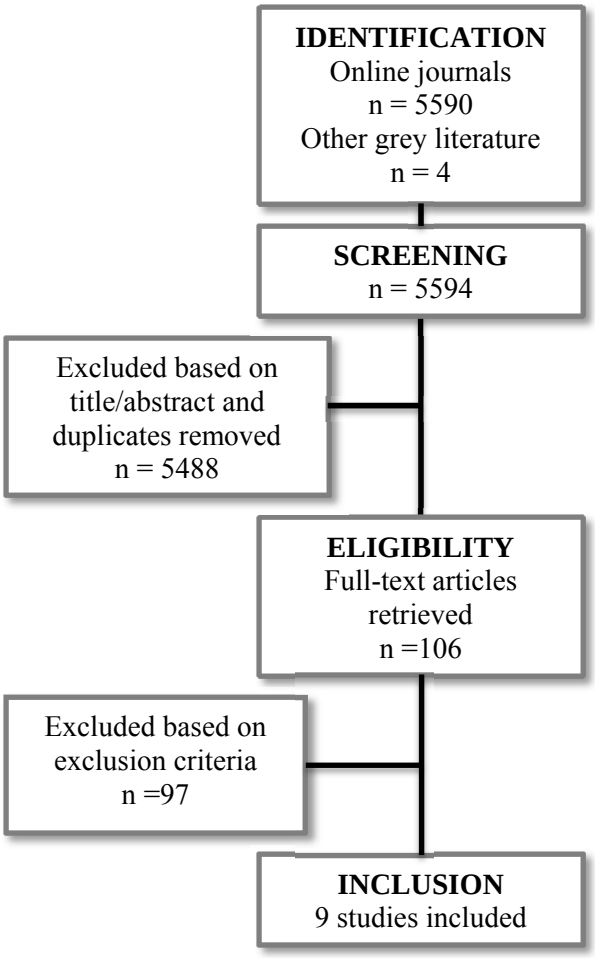

Figure 1. Study Selection Process

Study Assessment

All included studies were assessed by their study design, included nutrients and results. To enable an overall comparison of the individual knowledge scores achieved by pharmacists within each study, the results of each paper were converted to a percentage score. This allowed an average knowledge score of pharmacists to be calculated. For example, the study by Chang *et al* (2000) assessed pharmacist knowledge through use of a 15-question survey.[15] Pharmacists scored an average of 6.3 out of 15 (42%) on this survey.[15] Comparatively, in the study by Koh *et al* (2003) pharmacists received an average score of 7.2 out of 10 (72%) on a different survey.[27] In order to directly compare these studies with differing questionnaire sizes, all study results have been converted into percentage knowledge scores.

RESULTS

Study Selection

The electronic search process yielded 5590 potential journal articles for inclusion and 4 potential articles were identified via supplementary search processes. Of these studies, 5488 were excluded based title and abstract screening and duplicate removal. The remaining 106 articles were retrieved as full text documents and screened against the exclusion criteria. Ninety-seven articles were found to be ineligible for inclusion, as they did not satisfy the inclusion criteria of directly measuring the knowledge of specifically community pharmacists. Nine studies were included for the final analysis (Fig 1).

Included Studies

Nine studies were included in this review (Table 2). Of these studies, three were conducted in the United States[15,21,22], two in Canada[23,24], one in Jordan[25], Palestine[26], the United Kingdom[18], and Singapore.[27] Each of the included studies assessed a form of dietary supplement knowledge of community pharmacists. The median sample size of pharmacists was 100 (range: 46-388) with one study[23] only reporting the number of pharmacies approached and not number of pharmacists interviewed.

Study Design

Seven studies utilised a written survey method to assess community pharmacist knowledge.[15,18,21,24-27] Surveys utilised by these studies were posted, emailed or supplied directly to participants. One study interviewed participants with a face-to-face questionnaire-type survey.[22] The remaining study utilised mystery shoppers who anonymously approached pharmacy staff and recorded responses following departure

from the pharmacy.[23] Three studies were identified to have utilised comparison groups for assessing pharmacist knowledge.[21,23,26] Kemper *et al*. (2003) compared pharmacists' knowledge of dietary supplements to that of physicians, nurses and dieticians. The result of this was that both physicians and dieticians recorded higher scores, dieticians significantly so.[21] The study by Swelieh *et al* (2011) assessed the knowledge of Palestinian pharmacists against that of Saudi pharmacists.[26] Key findings of this study were that Palestinian community pharmacists' knowledge of dietary supplements was consistently lower than that of their Saudi Arabian counterparts.[26] Finally, research by Temple *et al*. (2013) compared the knowledge of pharmacists in 56 community pharmacies to that of workers in 192 health food stores across Canada.[23] This study found that community pharmacists were consistently more likely to give accurate recommendations regarding dietary supplements.[23]

A broad selection of dietary supplements was assessed in the included studies (table 2). Pharmacist knowledge of echinacea was assessed most frequently in four of the nine studies (44%). Antioxidants, garlic, ginkgo biloba, St John's Wort and assorted macronutrients were assessed at the second highest frequency of three out of the nine studies (33%). Pharmacists' knowledge of both folic acid and fibre use and appropriate dose were assessed in two studies (22%) and all remaining dietary supplements were only assessed in a single study.

Included Study Results

The median percentage knowledge score community pharmacists received was 64%. A wide variation of results was observed across each of the included studies. The pharmacist knowledge score ranged between 41.3% and 82%, respectively.[24,26] In a

total of four (44%) of the included studies pharmacists knowledge scores were below 50% and in only one study did pharmacists score a mean result of above 75%.

Table 1. Characteristics of included studies assessing community pharmacist knowledge of dietary supplements.

Study	Origin	Study Design	Pharmacist Sample Size	Comparison Group	Dietary Supplement Knowledge Assessed		No of Questions	Knowledge Score[#]
Chang et al. 2000	United States of America	Face-to-Face Survey	117	-	St Johns Wort, Saw Palmetto Kava-kava	Echinacea	15	42%
Koh et al. 2003	Singapore	Face-to-Face Survey	120	-	St Johns Wort Echinacea Garlic	Ginseng Ginkgo Biloba	10	72%
Kemper et al. 2003	United States of America	Email Survey	46	111 Physicians 30 Nurses 350 Dieticians	Echinacea Macronutrients* Amino Acids Garlic	St Johns Wort Creatine Ginkgo Biloba	20	45%
Macdiarmid et al. 1993	United Kingdom	Mailed Survey	75	-	Vitamin B12 Folic Acid Macronutrients* (recommended intake, common foods)	Antioxidants** Fibre	14 Assessment Based (20 Total)	68%
Offricht & Malone 1996	United States of America	Interview	70	-	Antioxidants **		10 Assessment Based (17 Total)	46%
Shilbayeh S. 2011	Jordan	Self-administered Survey (Distribution method unknown)	388	-	Antioxidants** Vitamins & Minerals*** (adverse effects, recommended intake)		12 Assessment Based (44 Total)	64%
Sweileh et al. 2011	Palestine	Face-to-Face Survey	100	Saudi Arabian Pharmacists	Capsaicin Eucalyptus Senna Valerian Root Echinacea Citrus Aurantum	Garlic Gingkgo Biloba Black Cohosh Hawthorn Horse chestnut seed	10	41%
Temple et al. 2013	Canada	Mystery Shoppers	Not recorded (56 Pharmacies Involved)	192 Health Food Stores	Lecithin Pyruvate Beta-Carotene	Shark Cartilage Bee Pollen	1 per store	68%
Wadsworth L. 1997	Canada	Mailed Survey	149	-	Folate Fibre Macronutrients* (recommended intake)		8 Assessment Based (16 Total)	87%

* Macronutrients include carbohydrates, proteins & fats

** Antioxidants includes Vitamins A, C and E

*** Specific vitamins and minerals were unspecified

The results of each paper converted to a percentage score to enable comparison of the knowledge scores achieved by pharmacists.

Table 2. Frequency Dietary Supplements Assessed.

Dietary Supplement	No. Times Assessed	Dietary Supplement	No. Times Assessed
Amino Acids	1	Ginkgo Biloba	3
Antioxidants*	3	Ginseng	1
Beta-Carotene	1	Hawthorn	1
Bee-Pollen	1	Horse Chestnut Seed	1
Black Cohosh	1	Kava-Kava	1
Cirtus Auranthum	1	Lacithin	1
Creatine	1	Macronutrients**	3
Cyanocobalamin	1	Pyruvate	1
Echinacea	4	Saw Palmetto	1
Eucalyptus	1	Senna	1
Feverfew	1	Shark Cartilage	1
Fibre	2	St Johns Wort	3
Folate	2	Valerian Root	1
Garlic	3	Unspecified***	1

* Antioxidants includes Vitamins A, C and E
** Macronutrients include carbohydrates, proteins & fats
*** Specific vitamins and minerals were unspecified

DISCUSSION

Study Designs

A variation in study design was observed. Of the nine included studies, three utilised a face-to-face survey method for ascertaining nutritional knowledge of pharmacists. A single study interviewed its sample group and another utilised mystery shoppers to gain information. The remaining four studies conducted their surveying through a questionnaire that was not conducted in a face-to-face manner. Each of these methods may have impacted the results of the study. The face-to-face method of conducting each questionnaire may have allowed for more valid responses from community pharmacists as they are unable to source the answers to the survey as they might when completing an emailed or posted survey. However, being assessed in this manner may have created anxiety and affected the confidence in which the pharmacists gave their responses. The mystery shopper method removes this aspect of being examined and is

therefore likely to elicit a more natural response from those being questioned. However, the mystery shopper method relies on the memory of the examiner who must recollect the conversation with the pharmacists following the completion of the interview and exit from the store. Also, in the included paper by Temple *et al*. (2013) the mystery shopping was conducted by undergraduate students and subsequently there is uncertainty of the accuracy of recording.[23] Future studies in this area would benefit from utilising a structured interview conducted in either a face-to-face manner of via a mystery shopper exercise.

Included Dietary Supplements

Echinacea was the most frequently assessed dietary supplement across the included studies. This was closely followed by the assessment of pharmacist knowledge of antioxidants (vitamins A, C and E), garlic, ginkgo biloba, St Johns wort and assorted macronutrients. Interestingly, this increased assessment of knowledge of these products does not reflect the level of purchase and use that these products reach.

In the most recent American National Health and Nutritional Examination survey, the most frequently used dietary supplement by adults were multivitamin/multiminerals (33%).[28] Between 28-30% of participants reported using products containing vitamins B6, B12, C, A, or E; 18–19% reported using iron, selenium, and chromium; and a further 26–27% reported using a zinc- and magnesium-containing supplement.[28] These products are therefore commonly utilised and are sold in in community pharmacies. Currently, research only exists assessing community pharmacist knowledge of three of these 11 products.

This trend is reflected in dietary supplement usage data from Australia and the United Kingdom. In the most recent National Diet and Nutrition Survey of Great Britain, fish-based supplements, multivitamins and multiminerals were taken by the highest proportion of participants.[30] In the most recent Australian National Nutrition Survey, Vitamin C was the most common supplement taken by adults followed closely by vitamin B, multivitamins, calcium and vitamin E. Pharmacists have currently only been assessed for their knowledge of two of the five most commonly used products.

Knowledge Results

As the global use of dietary supplements continues to increase, the sale of dietary supplements from community pharmacies will continue to increase. This review, however, suggests that globally, the knowledge of the community pharmacists selling these products is not increasing to match the increasing sales. The median test result that community pharmacists scored was 64% and in only one study did the assessed pharmacists score above 75%. This result suggests that greater efforts are required to increase the knowledge of community pharmacists of dietary supplements and their role in improving health.

The reasons for the low knowledge test score of the participants in these studies is unknown. Numerous pharmacy courses across the United Kingdom, United States and Australia do not include compulsory nutrition specific units.[18,19] This may be due to a lack of evidence supporting the efficacy of some of these products. However, research has found that patients trust pharmacists implicitly, and therefore it is suggested that if these products are to be sold in pharmacies, there is an ethical responsibility for these health professionals to provide up to date and accurate information about the

products, whether or not they have proven efficacy.[17] Pharmacists may also not be investing time into undertaking appropriate continuing professional development, but this remains speculative and warrants further study.

This study has also illustrated that more commonly used nutritional supplements have not been examined in the reviewed papers. Community pharmacists have not had their knowledge of frequently used nutritional products such as calcium or vitamin D assessed. It is likely that pharmacists have a greater knowledge of these nutritional products that they encounter more regularly. Further research is therefore required to determine the extent of community pharmacist knowledge of these products.

CONCLUSIONS:

This systematic review has revealed that there is currently little research investigating the knowledge of community pharmacists of dietary supplement products and that the supplements that have been examined in current research do not reflect current international usage trends. The results of the existing research suggests there is significant scope to improve pharmacist knowledge.

Funding This research received no support from any funding agency in the public, commercial, or not-for-profit sectors.
Conflicts of Interest The authors of this Research Paper declare no conflict of interest.

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